

Claims

We claim:

1. A method for locating a point of interest in a region, wherein an approximate model of the region is known, the method comprising:

5 determining one or more characteristics of a region of interest within the region, wherein said region of interest includes the point of interest;

determining a continuous trajectory based on the one or more characteristics of the region of interest, wherein the continuous trajectory allows measurement of the region of interest;

10 measuring the region of interest at a plurality of points along the continuous trajectory to generate a sample data set;

performing a surface fit of the sample data set using the approximate model to generate a parameterized surface; and

15 calculating a location of the point of interest based on the parameterized surface.

2. The method of claim 1, wherein the one or more characteristics of the region of interest comprise a radius of the region of interest.

3. The method of claim 1, wherein the one or more characteristics of the region of interest comprise an approximate location of the point of interest, wherein said approximate location of the point of interest comprises a center of the region of interest.

4. The method of claim 1, further comprising:
measuring the region of interest at the point of interest to confirm correctness of
25 the calculated location.

5. The method of claim 1, wherein said determining a continuous trajectory which allows sampling of the area of interest comprises determining a scan trajectory based on smoothly connected overlapping circles.

6. The method of claim 1, wherein the region of interest comprises a data distribution, and wherein the point of interest comprises an extremum of the data distribution.

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7. The method of claim 1, wherein the data distribution comprises a Gaussian distribution, and wherein the point of interest comprises a Gaussian peak of the Gaussian distribution.

10 8. The method of claim 1, wherein the region has a dimensionality of one of one, two, and three.

9. The method of claim 1, wherein the region has a dimensionality greater than three.

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10. The method of claim 1, further comprising:
locating the region of interest in the region.

11. The method of claim 10, wherein said locating the region of interest in the
20 region comprises:

scanning the region to locate two or more points of the region of interest, wherein each of the two or more points has associated measured data;

determining a local point of interest in the region of interest proximate to the two or more points of the region of interest;

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12. The method of claim 11, wherein said two or more points of the region of interest comprise an entry point and an exit point of the region of interest, the method further comprising:

scanning along a first scan line between the entry point and the exit point to determine said local point of interest;

calculating a second scan line, wherein the second scan line passes through said local point of interest, and wherein the second scan line is orthogonal to the first scan

5 line; and

measuring the region along the second scan line to generate second scan line associated measured data.

13. The method of claim 12, further comprising:

10 determining a second local point of interest along the second scan line based upon the second scan line associated measured data;

determining a center of the region of interest based upon one or more of the second local point of interest and the first local point of interest; and

15 providing a radius, wherein the region of interest comprises an area of the region within the radius of the determined center.

14. The method of claim 1, further comprising:

generating output indicating the calculated location of the point of interest.

20 15. A system for locating a point of interest in a region, wherein an approximate model of the region is known, the system comprising:

a sensor; and

a computer which is operable to couple to said sensor, said computer comprising:

a CPU; and

25 a memory medium which is operable to store a scanning program;

wherein said CPU is operable to execute said scanning program to perform:

determining one or more characteristics of a region of interest within the region, wherein said region of interest includes the point of interest;

determining a continuous trajectory based on the one or more characteristics of the region of interest, wherein the continuous trajectory allows measurement of the region of interest;

measuring the region of interest with said sensor at a plurality of points
5 along the continuous trajectory to generate a sample data set;

performing a surface fit of the sample data set using the approximate model to generate a parameterized surface; and

calculating a location of the point of interest based on the parameterized surface.

10 16. The system of claim 15, wherein the one or more characteristics of the region of interest comprise a radius of the region of interest.

17. The system of claim 15, wherein the one or more characteristics of the region of interest comprise an approximate location of the point of interest, wherein said
15 approximate location of the point of interest comprises a center of the region of interest.

18. The system of claim 15, wherein said program instructions are further operable to perform:

measuring the region of interest with said sensor at the point of interest to confirm
20 correctness of the calculated location.

19. The system of claim 15, wherein said determining a continuous trajectory which allows sampling of the area of interest comprises determining a scan trajectory based on smoothly connected overlapping circles.

25 20. The system of claim 15, wherein the region of interest comprises a data distribution, and wherein the point of interest comprises an extremum of the data distribution.

21. The system of claim 15, wherein the data distribution comprises a Gaussian distribution, and wherein the point of interest comprises a Gaussian peak of the Gaussian distribution.

5 22. The system of claim 15, wherein the region has a dimensionality of one of one, two, and three.

23. The system of claim 15, wherein the region has a dimensionality greater than three.
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24. The system of claim 15, wherein said program instructions are further operable to perform:

locating the region of interest in the region.

15 25. The system of claim 24, wherein said locating the region of interest in the region comprises:

scanning the region with said sensor to locate two or more points of the region of interest, wherein each of the two or more points has associated measured data;

determining a local point of interest in the region of interest proximate to the two
20 or more points of the region of interest;

26. The system of claim 25, wherein said two or more points of the region of interest comprise an entry point and an exit point of the region of interest, wherein said program instructions are further operable to perform:

25 scanning with said sensor along a first scan line between the entry point and the exit point to determine said local point of interest;

calculating a second scan line, wherein the second scan line passes through said local point of interest, and wherein the second scan line is orthogonal to the first scan line; and

sampling the region along the second scan line to generate second scan line associated measured data.

27. The system of claim 26, wherein said program instructions are further
5 operable to perform:

determining a second local point of interest along the second scan line based upon the second scan line associated measured data;

determining a center of the region of interest based upon one or more of the second local point of interest and the first local point of interest; and

10 providing a radius, wherein the region of interest comprises an area of the region within the radius of the determined center.

28. A memory medium containing program instructions which are executable to locate a point of interest in a region, wherein an approximate model of the region is
15 known, and wherein said program instructions are executable to perform:

determining one or more characteristics of a region of interest within the region, wherein said region of interest includes the point of interest;

determining a continuous trajectory based on the one or more characteristics of the region of interest, wherein the continuous trajectory allows measurement of the region
20 of interest;

measuring the region of interest with a sensor at a plurality of points along the continuous trajectory to generate a sample data set;

performing a surface fit of the sample data set using the approximate model to generate a parameterized surface; and

25 calculating a location of the point of interest based on the parameterized surface.

29. The memory medium of claim 29, wherein the one or more characteristics of the region of interest comprise a radius of the region of interest.

37. The memory medium of claim 29, wherein said program instructions are further executable to perform::

locating the region of interest in the region.

5 38. The memory medium of claim 37, wherein said locating the region of interest in the region comprises:

scanning the region to locate two or more points of the region of interest, wherein each of the two or more points has associated measured data;

determining a local point of interest in the region of interest proximate to the two
10 or more points of the region of interest;

39. The memory medium of claim 38, wherein said two or more points of the region of interest comprise an entry point and an exit point of the region of interest, the memory medium further comprising:

15 scanning with said sensor along a first scan line between the entry point and the exit point to determine said local point of interest;

calculating a second scan line, wherein the second scan line passes through said local point of interest, and wherein the second scan line is orthogonal to the first scan line; and

20 measuring the region with said sensor along the second scan line to generate second scan line associated measured data.

40. The memory medium of claim 39, wherein said program instructions are further executable to perform:

25 determining a second local point of interest along the second scan line based upon the second scan line associated measured data;

determining a center of the region of interest based upon one or more of the second local point of interest and the first local point of interest; and

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providing a radius, wherein the region of interest comprises an area of the region within the radius of the determined center.

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